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1. Introduction

In October 2000, the US Department of Energy, along with NOAA and several other government labs and universities, conducted the Vertical Transport and Mixing Experiment (VTMX) and URBAN2000 field programs in Salt Lake City, Utah (Alwine et al., 2002). The VTMX program focused on the basin-scale flow regime, where the URBAN2000 component focused on transport and dispersion in the downtown Salt Lake City area. In this paper, we will focus on a specific Intensive Operations Period, IOP-10, which occurred on October 25-26, 2000.

IOP-10 was chosen because the winds in the downtown area were fairly weak and variable early in the experiment, and became more windy in the later part of the IOP. The local conditions were influenced by a shortwave ridge, and were cloudy, with a weak and very shallow surface inversion, and light mean southerly flow over the area. In order to prepare initial and boundary conditions for our LES modeling studies of the downtown area, we will present an analysis of some the observations taken during IOP-10.

2. Discussion

Vertical profiles of wind speed and direction were obtained at two locations in the vicinity of downtown Salt Lake City, Utah. The Dugway Proving Grounds (DPG) sodar was located in the downtown area, on top of the Bennett Federal Building, located at the intersection of S. State St. and 100 South St., approximately 110^o 53.15' W longitude, 40^o 45.67' N latitude. The rooftop is approximately 30m above ground level, out of the influence of the urban canyon, but within the urban canopy layer. The NOAA sodar and wind profiler are co-located at the Raging Waters park, located southwest of the downtown area at 1200 West 1700 South, at approximately 111^o 55.65' W longitude, 40^o 43.93' N latitude. The Raging Waters area is predominantly suburban/industrial park, with 1-2 store buildings. It is also near the Jordan river, within 4 miles of the SLC International Airport, and 7 miles of the Great Salt Lake.

Two 1 hour averages, from 01:00-02:00 and 02:00-03:00 MDT, of the wind speed and direction are shown in Figure 1(b). At the NOAA site, the sodar and profiler are in good agreement in both wind speed speed and direction, showing there is an increase in wind speed during this period, and the flow tends to become more southeasterly. However, one can see a large difference between the NOAA and DPG sites. The DPG sodar observes a substantial reduction in the wind speed as a function of height, likely due to the drag effect associated with the downtown area. Another possible explanation could be a blocking effect due to the nearby mountain range. Unfortunately there were no vertical profiles of temperature measured in the downtown or central basin during IOP-10, which could have allowed a more detailed analysis of the stability and Froude number effects. In any case, this velocity deficit must be accounted for in model simulations of the downtown area. Simply relying on the upper air observations in the central basin or soundings in a predominantly suburban area would lead to an over estimation if the wind speed in the downtown area.

A plot of the urban canyon winds near the SF6 release point, located in the vicinity of 111^o 53.17' W longitude and 40^o 45.7' N latitude, are shown in Figure 2. Shown are the 10 minute average wind vectors for the entire IOP-10 test, from 00:00 to 08:00 on 26 October 2000. The wind vectors lo-

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cated on top of the Heber Wells building show the flow to be bounded from the southwest to northeast sector, consistent with the flow aloft being southeasterly. Measurements in between buildings show much more directional variation, due to the shedding of eddies from the buildings.

3. Conclusion

The effects of urban canopy drag and flow complications in urban canyons have been shown in the observations of the URBAN2000 field program. A preliminary analysis of some observations taken at the VTMX/URBAN2000 field program illuminates some of the difficulties in measuring urban flows and turbulence. For accurate modeling and simulation of urban dispersion, accurate vertical profiles of winds and temperature are required, particularly near the dispersion source. Lessons-learned from the URBAN2000 project will be invaluable for future observational studies, and subsequent simulation, of pollutant dispersion in urban areas. A more detailed analysis of the upper air data and turbulence statistics from the sonic anemometers will be presented in the poster accompanying this paper.

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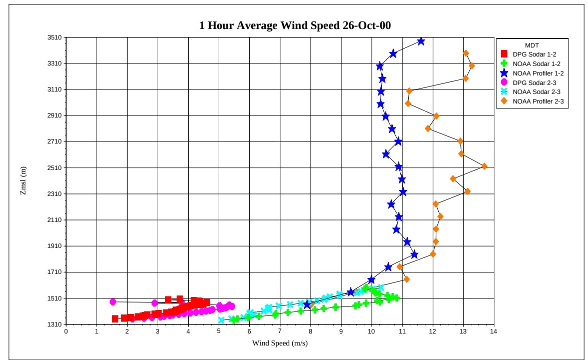
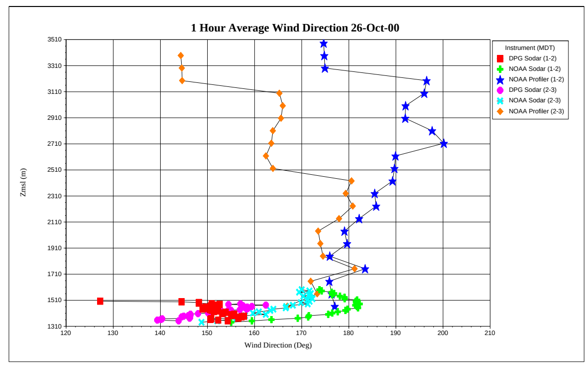
References

Alwine, K., J. Shinn, G. Streit, K. Clawson, and M. Brown: 2002, Overview of urban2000: A multi-scale field study of dispersion through an urban environment. *Accepted Bull. Amer. Meteor. Soc.*.



(a)



(b)

Figure 1: Comparison of the Dugway sodar, NOAA sodar and profiler observed wind (a) speed and (b) direction. Note the urban canopy/drag effect.

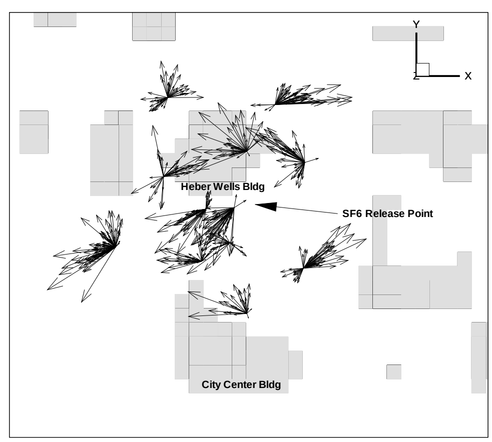


Figure 2: Los Alamos, Lawrence Livermore, and NOAA sonic anemometer observations near the SF6 release point during IOP-10.